

WHAT IS CLAIMED IS:

1. A method of depositing a low resistivity tungsten film onto a wafer comprising the steps of :

5 (a) introducing a metalorganic tungsten-containing compound into a deposition chamber of a CVD apparatus;

(b) maintaining the deposition chamber at a pressure and the wafer at a temperature suitable for the high
10 pressure chemical vapor deposition of the tungsten film onto the wafer;

(c) thermally decomposing the tungsten-containing compound in the deposition chamber; and

(d) vapor-depositing the tungsten film onto the
15 wafer thereby forming a low-resistivity tungsten film.

2. The method of claim 1, wherein the introduction of the metalorganic tungsten-containing compound into the
20 deposition chamber of a CVD apparatus comprises the steps of:

(a) subliming the metalorganic tungsten-containing compound to a gaseous phase;

(b) stabilizing the flow of the tungsten-containing gas;

(c) mixing the tungsten-containing gas with a carrier
25 gas; and

(d) flowing the tungsten-containing/carrier gas mixture to the deposition chamber.

3. The method of claim 2, wherein the sublimation occurs at about 75 °C.

5 4. The method of claim 2, wherein the carrier gas is argon, helium or nitrogen.

10 5. The method of claim 1, wherein the metalorganic tungsten-containing compound is a $W_x(CO)_y$ compound

15 6. The method of claim 5, wherein the compound is tungsten hexacarbonyl.

20 7. The method of claim 1, wherein the chamber pressure is from about 0.1 Torr to about 20 Torr.

8. The method of claim 1, wherein the wafer temperature is from about 200 °C to about 500 °C.

25 9. The method of claim 1, wherein the resistivity of the tungsten film is less than about 30 micro-ohm centimeter.

10. The method of claim 9, wherein the resistivity of the tungsten film is from about 10 micro-ohm centimeters to about 20 micro-ohm centimeters.

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11. A method of depositing a low resistivity tungsten film onto a wafer comprising the steps of :

(a) subliming the metalorganic tungsten-containing compound to a gaseous phase;

10 (b) stabilizing the flow of the tungsten-containing gas;

(c) mixing the tungsten-containing gas with a carrier gas;

(d) flowing the tungsten-containing/carrier gas mixture to the deposition chamber

15 (e) maintaining the deposition chamber at a pressure and the wafer at a temperature suitable for the high pressure chemical vapor deposition of the tungsten film onto the wafer; and

20 (f) thermally decomposing the tungsten-containing compound in the deposition chamber; and

(g) vapor-depositing the tungsten film onto the wafer thereby forming a low-resistivity tungsten film.

25 12. The method of claim 11, wherein the sublimation occurs at about 75 °C.

13. The method of claim 11, wherein the carrier gas is argon, helium or nitrogen.

5 14. The method of claim 11, wherein the metalorganic tungsten-containing compound is a $W_x(CO)_y$ compound

10 15. The method of claim 14, wherein the compound is tungsten hexacarbonyl.

15 16. The method of claim 11, wherein the chamber pressure is from about 0.1 Torr to about 20 Torr.

20 17. The method of claim 11, wherein the wafer temperature is from about 200 °C to about 500 °C.

25 18. The method of claim 11, wherein the resistivity of the tungsten film is less than about 30 micro-ohm centimeter.

30 19. The method of claim 18, wherein the resistivity of the tungsten film is from about 10 micro-ohm centimeters to about 20 micro-ohm centimeters.

20. A method of depositing a low resistivity tungsten film onto a wafer comprising the steps of :

(a) subliming tungsten hexacarbonyl to a gaseous phase at about 75 °C;

5 (b) stabilizing the flow of the tungsten hexacarbonyl gas;

(c) mixing the tungsten hexacarbonyl gas with a carrier gas;

10 (d) flowing the tungsten hexacarbonyl/carrier gas mixture into a deposition chamber of a CVD apparatus;

15 (e) maintaining the deposition chamber at a pressure from about 0.1 Torr to about 20 Torr and the wafer at a temperature from 200 °C to about 500 °C wherein these conditions are suitable for the high pressure chemical vapor deposition of the tungsten film onto the wafer;

(f) thermally decomposing the tungsten hexacarbonyl gas in the deposition chamber; and

(g) vapor-depositing the tungsten film onto the wafer thereby forming a low-resistivity tungsten film.

21. The method of claim 20, wherein the carrier gas is argon, helium or nitrogen.

22. The method of claim 20, wherein the resistivity of the tungsten film is less than about 30 micro-ohm centimeter.

23. The method of claim 22, wherein the resistivity of the tungsten film is from about 10 micro-ohm centimeters to about 20 micro-ohm centimeters.

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24. A low-resistivity tungsten film formed by the method of claim 1.